# Phoenix Islands Restoration Project

"Protecting the critically important Phoenix Islands - home to globally important seabird populations and vital to migratory bird routes across the Central Pacific."

## TRAINING WORKSHOP ON KIRITIMATI ISLAND

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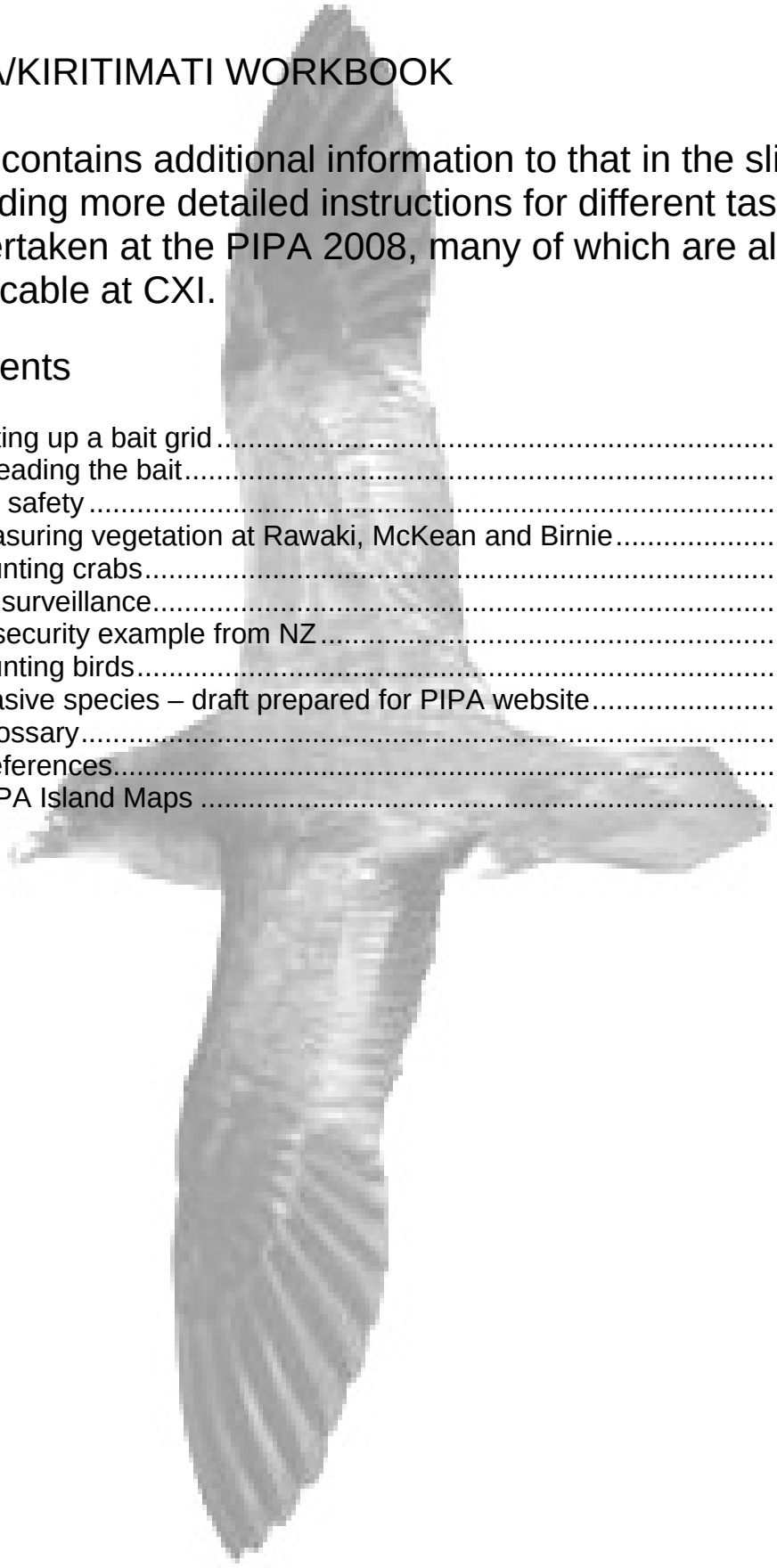
# PIPA/KIRITIMATI WORKBOOK

This contains additional information to that in the slides, including more detailed instructions for different tasks to be undertaken at the PIPA 2008, many of which are also applicable at CXI.

## Contents





# SETTING UP A BAIT GRID

**Aim**: to cover the entire island with a thorough marked grid that ensures when the bait is spread from the grid points it will reach all of the pest animals being targeted

**Equipment**:

1. 1 compass per two-person team
2. 1 GPS and spare set of batteries per team
3. 1 measuring tape or measured length of cord (knotted every 25m) per two person team
4. Notebook and pencils
5. Highly visible marker tape (different colours for the different teams)
6. Waterproof marker pen
7. Quantity of wire pegs (if there is a lack of vegetation to tie marker tape to)

**Method:**

Examine the area that is to have grid (preferably both on a map and on site). Work out how best to cover the entire island. Work out how to get around big obstacles (cliffs, ponds, etc). Identify start and finish points for each area on the island.

The supervisor is to choose sensible start points for grid lines (usually one edge of island) and the compass direction (all teams have to go in exactly the same direction!)

Form teams of two. There should be at least two teams and more if possible. Ensure you have all the **e**quipment listed above in each team. Each team separates from the other teams by 25m along the start line.

Mark the start point with marker tape and the supervisor will give a letter for the line (lines should be numbered A, B, C, … etc) so that later on we can know which line is which for baiting and re-checking. Mark this letter on the tape with a marker pen. Each team to start their GPS's and take GPS readings of start point, marking it as a way point (if on Line A, call the start waypoint 'A', if on Line B call it 'B', etc).

One person holds one end of measuring tape or cord, and with the compass takes a compass bearing and directs the second person, who walks out 25m, as measured on the tape or knot in the cord. Once 25m has been reached, the person with compass will direct the second person with hand signals or talking to the exact compass direction required. The second person will then mark that spot clearly with marker tape (make sure it is

easily visible from a distance of 10m or more). Each marked gridpoint will be GPS'ed as a waypoint by one of the two-person team.

The second person will then move another 25m along the compass bearing, as guided by the person with compass, and once on the exact spot will mark it with marker tape. The first person will then walk to catch up with them, and the process will be repeated until the other side of the island or end point is reached. Make sure you mark and GPS waypoint the finishing point.

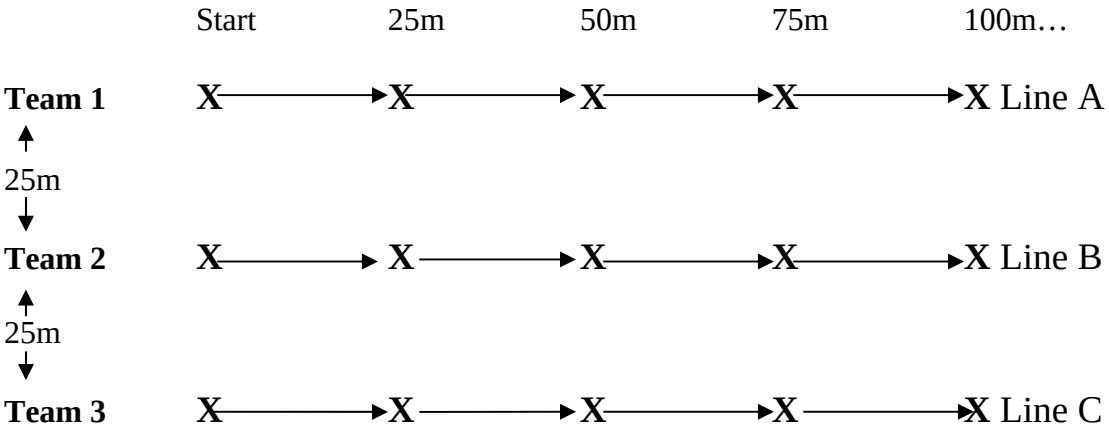
If possible work at same pace as other teams (it's **not** a race!), so you can double-check you are still the right distance apart.

When the end point is reached check that you are still 25m apart from the other teams (a minimum of 20m and maximum of 30m is okay). If gaps are larger or smaller than this, the lines will need to be re-checked for where the error may have occurred and the line(s) may possibly need to be done again.

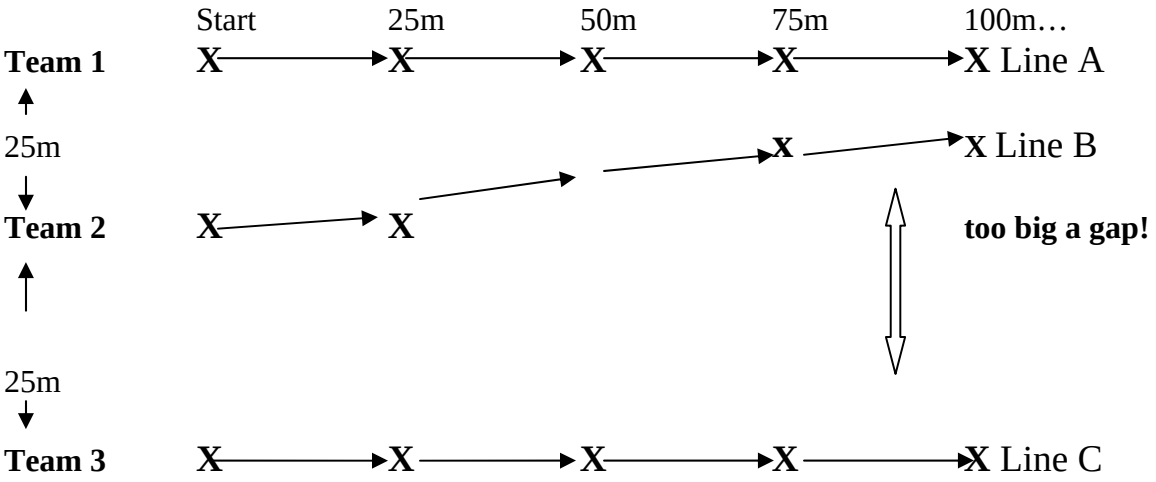
One person in each two-person team is to record in the notebook how many grid points they have placed out on each line (the number of waypoints entered in the GPS will confirm this).

The supervisor or project manager will use these waypoints to develop a map of the grid system, and this can be used when it comes to spreading the bait, and will also further help to check if there are any gaps in the grid (if there are gaps in the grid, they will need to be filled with more gridpoints before bait is spread).

The grid should hopefully look something like this at the end, where each 'X' is a grid point marked by a marker tape.



The picture below shows how things can go wrong. Team 1 and Team 2 may think they have done okay, but because Team 2 did not follow accurate compass direction they are too close to Team 1. This has caused a big gap between Team 2 and Team 3 where a rat may live and not get any bait. This could cause failure of the entire operation.




## SPREADING THE BAIT

**Aim:** To spread enough bait to kill all the rats over the entire island, with no gaps in coverage

**Equipment:**

- Supervisor to have map of gridlines.
- Notebook and pencils
- GPS and spare set of batteries
- Bucket full of bait
- Bait scoop (supervisor to check everyone has the right size bait scoop)
- Backpack with another 10kg of bait
- Safety gear – gloves, dustmask, glasses, water bottle [*to be added to*]

The Team is made up of:

- one supervisor – to follow behind bait spreaders, checking everyone is doing ok, and to help solve any problems.
- bait spreaders – to spread the bait out over the grid
- bait carriers – people to carry and place bait at sites all around the island at convenient points of the bait spreaders to refill their buckets.

**Method:**

Amount of bait to spread at each grid point will have already been decided by the supervisor or project manager, depending on many factors (how many rats there are, how many land crabs, etc)

Go to start of lines

Each bait spreading person is to be allocated a gridline by the supervisor. Each grid line should be marked with a single colour of tape so that it is easy to follow, with adjacent grid lines being of a different colour. Start GPS's and confirm you are on correct line.

At the start point, and at each subsequent grid point marked by a marker flag, throw out 5 scoops full of bait. Each scoop full should be thrown out in a different direction and scattered as much as possible. The picture below shows how this is done. When this is completed, move on to the next grid point and repeat the process (i.e. another 5 scoops spread).

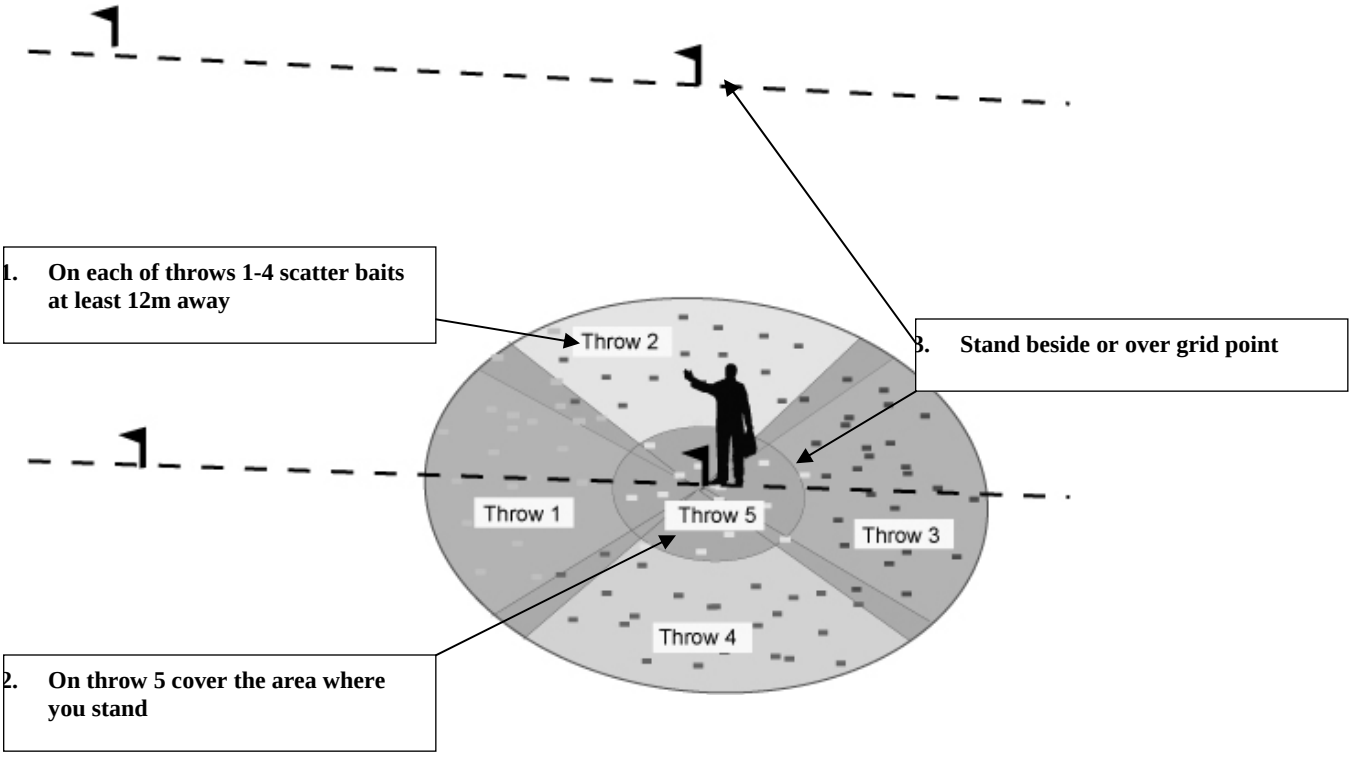
Always try to spread the bait in the same way each time to establish a regular method – it's amazing how often you may forget to count to five if you have to do it all day!

Work at the same pace as other people, so that you all work 'line-abreast' across the island. This makes doubly sure there are no gaps, and makes sure no one accidentally starts doing someone else's line!

If any problems are encountered, call or wave to the supervisor. Other bait spreaders should halt until the issue is sorted out, and all start work again together.

Refill or top up the bait buckets and backpack whenever needed, and when you reach any stacks of poison bait. All baiters should do this at the same time.

Stop when you reach the end of the line (remember to bait the last grid point), and the supervisor will allocate the next line for you to do.



# 3. BAIT SAFETY

**About Brodifacoum**

Pestoff 20R bait is mostly made of flour and grain like a biscuit but it contains the poison brodifacoum. It's the poison that kills the rats after they've eaten the bait by stopping their blood from clotting.

This type of poison takes a long time to work, about 4 days for most rats. This slow action is an important advantage for eradication because the rats keep eating and they don't know they've been poisoned until it's too late for them. The disadvantage of this is that it works the same on people too so we have to be careful not to get any poison because the symptoms take a long time to show.

Brodifacoum will kill just about any animal that eats the baits and can also be transferred from the poisoned animal to something else that eats that animal. For example if a dog ate a dead rat that had been killed by brodifacoum baits, the dog could die or get sick too. Another example is if chickens ate the bait and then you killed that chicken for dinner, you would be eating the poison.

Brodifacoum is very toxic to rats but will also kill other mammals (humans, rabbits, cats, dogs, cattle, goats, pigs, sheep, etc).

One thing brodifacoum doesn't kill is invertebrates like insects and crabs. This is because they have a different blood system than bony animals. However crabs will still eat the bait and have the poison in their meat for a few weeks so it's important not to take crabs from areas where poison baits have been used.

Humans eating coconut crabs or anything else that have eaten bait may also be at risk. **Do not eat crabs from areas that have been treated with this bait!**

The poisoning risk in a treated area decreases over time as the bait or dead animals decay. However, there may still be a risk in treated areas for weeks if not months, especially for predators or scavenging animals that eat large amounts of poison-tainted material e.g. live crabs that have eaten bait, or remains of dead animals.

It takes a lot of this bait to kill an *average* human mainly because we're much bigger than a rat – adults would need to eat about 750 grams of the bait pellets, however a small child would need to eat about 180 grams it's very important that children can't get the bait because the little ones are the most likely to put things in their mouths and their small size makes them more vulnerable. It is unlikely to be a serious risk to most humans unless they deliberately eat lots of it, but **bait handlers like us** who may be handling it repeatedly over many days **can also be at risk** [– the poison can be absorbed through the

lungs (dust from bait breathed in), or through the skin, and accumulate in your body over days or weeks. It takes a long time for the body to break it down and remove it, so repeated contact may add to that already in your body.

Some people may be at greater risk than the average person – especially people with anaemia or liver disorders, or those already taking prescribed anticoagulant medicines for heart or cholesterol poisons.

There is an antidote (Vitamin K) but it requires careful treatment from trained medical staff. If poisoning is suspected, follow the procedure on the Material Safety Data Sheet (attached) and seek medical advice.]

Let's look at the symptoms of poisoning – you can always find them on the label so you can look them up if you need to anytime you're working with poisons.

**Symptoms of poisoning:**

NB. – in some people sometimes no obvious symptoms may show.

Behaviour – lethargy, depression, exercise intolerance, coughing

Visible symptoms – pale-looking (anaemic), sore or swollen joints, bleeding gums, bleeding nose, easy bruising and large bruises developing, blood in urine or faeces. Severe symptoms include weak or erratic heartbeat, coma, coughing blood.

Can also be a mild eye and skin irritant.

**Safety:**

1. Always keep away from children and non-target animals
2. Always close containers when not being used
3. Keep in original containers until immediately before application
4. Never use buckets used to carry bait for any other purpose such as carrying food or drinking water
5. Use gloves, dust mask and protective clothing and footwear when handling baits
6. Do not eat, drink or smoke while handling the bait
7. Always wash hands, arms and face and change contaminated clothes for clean ones before handling food or preparing or eating meals.
8. Don't 'contaminate' areas like houses (or in our Phoenix Island case) the camp kitchen or sleeping tents by going into them with dirty protective

clothing – have a designated and isolated area where outer protective clothing is removed and stored separately to all other equipment and food

9. Put signs up in areas treated with the bait (sign example attached)
10. Dispose of any old bait or empty bait bags by incineration or deep burial.
11. Store and wash all clothing exposed to bait separately from other clothes to avoid cross-contamination

Safety Gear to always be taken (and worn) when baiting:

- Coveralls or long-sleeved shirt
- Eye protection
- Impermeable gloves
- Leather or rubber boots
- Dust mask (and spare)
- Plus a bottle of clean water for rinsing dust from eyes, face etc, if necessary.

# 4. MEASURING VEGETATION OF RAWAKI, MCKEAN AND BIRNIE

## Background

Mammalian pests (rabbits and rats) can have huge impacts on the composition of island vegetation over time through directly consuming palatable plants or their seeds and seedlings. For example some plants that are common on nearby Enderbury (e.g. *Tribulus*) are absent or scarce on Rawaki and co. Following the removal of rabbits and cats, it is expected that many of these palatable plant species will recover or recolonise these islands.

## Objectives

1. To measure plant species currently present as a baseline for any changes that may occur in the future (over many years)
2. To determine current distribution and abundance of main plants as a baseline for measuring any changes in the future.

## Methods

Photopoints – You will need digital camera, GPS and notebook in order to take photos from set photo-points on each island.

- Select 3 sites on each island that can easily be relocated in future (monument, mounds, old dwellings etc) and GPS the sites
- These 3 sites should allow view of representative of habitats (i.e. incorporate wide views of each island in plant-friendly habitat, i.e. not coral rubble)
- Take four digital photos from each photo-point (to the N, E, S, W) taken in that order. Set camera for standard lens (50 mm), i.e. not wide-angle or telephoto.
- Download and label pictures, save and make backup copies to memory sticks/CD/.
- In future years, compare new photos with originals from 2008 to examine any changes relative density of plants.

Maps – you will need island map (Appendix), pencil and GPS to map the approximate distribution of any dominant plants on each island and GPS the ends and key sites, e.g. where three different dominant plant types converge. Dominant plants are likely to be some of the following:

- Teutente ni mane (*Lepturus* spp.)
- *Boerhavia* sp.
- *Pisonia grandis*
- Uteuten toari (*Sesuvium*)
- *Portulaca*
- *Tribulus*

- *Sida* (Te koura)
- *Cordia*

Plant lists – you will need notebook and reference plant list (Appendix) to compile a plant species checklist for each island in 2008. Species recorded in 2006 are listed below.

| Family | Kiribati name | Species name | Rawaki | Birnie | McKean |
|---|---|---|---|---|---|
| Graminae | Teutente ni mane | *Lepturus pilgerianus* | ✓ | | |
| | Teutente ni mane | *Lepturus repens* | | | ✓ |
| Urticaceae | | *Laportea ruderalis* | ✓ | | |
| Nyctaginaceae | | *Boerhavia albiflora* | ✓ | ✓ | ✓ |
| | | *Pisonia grandis* | | | ✓ |
| Alzoaceae | Uteuten toari | *Sesuvium portulacustrum* | ✓ | ✓ | ✓ |
| Portulaceae | | *Portulaca aff. Lutea* | ✓ | ✓ | ✓ |
| Zygophyllaceae | | *Tribulus cistoides* | | | ✓ |
| Tiliaceae | | *Triumfetta procumbens* | Now absent | | |
| Malvaceae | Te koura | *Sida fallax* | ✓(2) | ✓ * | ✓ |
| Boraginaceae | | *Cordia subcordata;* te kanawa | ✓(1) | ✓ | ✓(1) |

# 5. COUNTING CRABS

## Background

Crabs, especially hermit crabs, can consume large amounts of bait, and we know little about what bait loadings are needed to overcome specific crab densities. Therefore we need to record crab densities for all bait operations.

## Objectives

Measure crab densities in representative habitat on Rawaki, Birnie and McKean.

## Equipment and Methods

- Set up transects on each island – c.20-40 per island
- Transects follow the bait lines on each island and are 2 m x 25 m
- Follow a stratified pattern (map it first)
- GPS the start (SW end) of each transect
- Survey after dark till c. 9 pm
- Use a 2 m long pole (aluminium or branch) with rope dangling from ends - may help to have flurotape at tip of string to improve visibility)
- Count all hermit crabs over c.2 cm diameter along the transect
- Identify and count any other crabs.
- Also record substrate and plant species cover as a % to nearest 10% (or indicate 1 % if less than 5%)
- Record wind and humidity on 0-4 scale
- If time permits replicate many of the transects on different nights in order to measure internight variability.

Island:

| Date | Time | Obs | Trans No. | M from Start | Gnd Moist | Cloud | Wind | %sand | %Port | %Boerh | %Sesu | %lept | %other | Hermit Crabs | Others CC | Others Ghost C | Waypoint E | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25/05/08 | 1912 | R Pierce | N1 | 50 | 0 | 0 | 1 | 60 | 20 | 10 | 10 | 1 | | 51 | 1 | | | |
| 25/05/08 | 1945 | R Pierce | N3 | 25 | 0 | 0 | 1 | 20 | 20 | 1 | 1 | 60 | 1 Sida | 26 | | | | |
| Sum | | | | | | | | | | | | | | 77 | 1 | | | |
| Average | | | | | | | | | | | | | | | | | | |
| SE | | | | | | | | | | | | | | | | | | |

Data sheet

# 6. ANT SURVEILLANCE

## Background

Invasive ants can impact on other insects, birds a, plants etc. We need to determine whether any invasive species of ant are present at PIPA/CXI. If none are present, then ensure they don't arrive (biosecurity) and keep ongoing surveillance. If present, then can they be eradicated and what further biosecurity is needed to ensure containment.

## Objectives

Determine what ant species are present at CXI/PIPA.

## Equipment and Methods

- Focus on landing sites, camps, storage areas, etc, GPS the site
- Set up 5 paired ant bait stations (small jars) on the ground at each site
- Each pair has a protein lure (one jar) and a sugar lure (other jar)
- Protein is peanut butter and soya bean oil
- Sugar is plug of cotton wool soaked in 20% sugar solution
- Operate for a few hours, possibly as little as half an hour if hot or crabs attack
- If any obvious ant colonies, collect ants from these too
- Preserve in ethanol/alcohol
- Label with location, date, GPS coordinates and your name and address as below
- Have them analysed by Agriculture (e.g. Aata) or get up to date advice from PII
- Respond accordingly, e.g. eradication, tighter biosecurity if a departure point.

| Example of datasheet for recording ant data in field | | | |
|---|---|---|---|
| Location:<br>Rawaki landing site | GPS cords:<br>E<br>S | Date: | Observers: |
| Habitat: e.g. sparse Boerhavia on coral sand, some wood debris | | | |
| Stations: 5 pairs comprising:<br>A: protein lure – peanut butter and soya oil<br>B: sugar solution – 20% sugar and water on cotton wool | | | |
| Samples sent to: | | | |
| Results received: details, e.g. see next table | | | |
| Action required, e.g. containment, eradication | | | |

## ANT SURVEILLANCE RESULTS OF PIPA CONSERVATION EXPEDITION 2006

**The table below provides details of ant species found on seven islands in May-June 2006 (Darren Ward, pers. comm).**

| Species | Rawaki | Birnie | Enderbury | Kanton | McKean | Orona | Nikumaroro |
|---|---|---|---|---|---|---|---|
| **Carnud** | **P** | | | | | | **P** |
| **Mondes** | **P** | | **P** | **P** | **P** | | **P** |
| **Monflo** | | | **P** | | **P** | | **P** |
| **Parlon** | | | **P** | | **P** | **P** | **P** |
| **Parvag** | | | | | | **P** | **P** |
| **Phemeg** | | | | | | **P** | **P** |
| **Tapmel** | | | **P** | | | | |
| **Tetsim** | | **P** | | | **P** | | |

**Species key: Carnud = Cardiocondyla nuda, Mondes = Monomorium destructor, Monflo = Monomorium floricole, Parlon = Paratrechina longicornis; Parvag = Paratrechina vaga; Phemeg = Pheidole megacephala, Tapmel = Tapinoma melanocephalum; Tetsim = Tetramorium simillimum**

## 7. BIOSECURITY – SOME NZ EXAMPLES

CD available at workshop showing NZ examples of Island biosecurity – Northland and Southland islands – including guidelines and standards for setting up island quarantine.

Example of checklist to use when visiting islands:

- Island guidelines
- Special permits and conditions, e.g. for landing at the PIPA
- Risk assessment – what might hitch-hike with the expedition?
- Safe source of supplies, etc.
- Pest-proof containers
- Surveillance on board
- Diseases e.g. no poultry eggs taken ashore
- Trained dogs for pest work etc must be vaccinated
- Final checks pre-landing
- Response procedures, e.g. Ripcord insecticide sprays, traps.

# 8. COUNTING BIRDS

## Background

Mammalian pests have caused the decline of seabirds on all three of these target islands, particularly McKean and Birnie where rats have eliminated the smaller, more sensitive species – blue noddies, storm petrel, petrels and most shearwaters. With the removal of rats and rabbits, these sensitive species are expected to recover or recolonise the newly pest-free islands. Measuring these responses requires a combination of techniques, including approximate counts from boats, if future landings on the islands cannot be made.

## Objectives

1. Determine nesting locations of Phoenix petrels in order to minimise our impacts during pest eradications
2. Determine locations of concentrations of any other sensitive species that may be nesting (particularly colonies of shearwaters and frigatebirds)
3. Determine numbers and status of all bird species currently present on each island as a baseline, with particular emphasis on the sensitive species.

## Methods

### 8.1. General precautions:

- Watch where you are putting your feet!
- Nests are often beneath plants like Portulaca, Lepturus and Boerhavia
- Walk round concentrations of **nesting** seabirds especially frigatebirds
- Where there are burrows, place foot at base of burrow, not on hummocks which could have burrow beneath

### 8.2. Precautions for Phoenix petrels on Rawaki:

- Work as one team with a supervisor. You will need headlamp, notebook, pencil, binoculars, flagging tape and marking pen, and the team will need map, GPS and banding gear.
- Determine Te Ruru locations from day 1 by observing where birds land during late afternoon and evening, and supplement this with night work (nest is usually beneath overhanging vegetation, shallow burrow, coral ledge etc)
- War-whoop to elicit responses – a sharp kek-kek-kek-kek-kek – from resident birds
- Capture and band birds with size E metal band, mark crown of each bird with twink (to avoid need for recapture)
- Mark each nest site with colour flagging tape on peg that indicates “important seabird”, GPS and number site, mark site on map of island
- Provide completed map to eradication team.

## 8.3. Precautions for shearwater and storm-petrel areas - mainly Rawaki:

- You will need same material as for Te ruru above.
- Observe where shearwater colonies (burrows) are located
- Determine a safe route through the shearwater colony between landing and camp at Rawaki and put out flagging tape (same colour as for Te Ruru) across this route
- Find and map colony locations of all shearwater colonies and provide to eradication team
- During night-work, note any concentrations of storm-petrels and flag and map these sites and band storm-petrels
- Demonstrate to eradication team ways of minimising impact to burrows.

## 8.4. Precautions for Frigatebirds – any island

- You will need notebook, pencil and map
- Observe where frigatebird concentrations during first day on island
- Determine nesting stage if nesting at all – eggs, chicks (estimate % with each)
- Map colony and provide map to eradication team – sites to avoid if they can.

## 8.5. Precautions for other species – te raurau (BLNO), tarangongo (GBTE)

- You will need notebook, pencil and map
- Assess situation on Rawaki where both of these species should be nesting
- Blue noddies will be scattered solitary nesters, grey-backs clustered
- Introduce team to nest sites and precautions, e.g. avoiding site where bird has flown up from..

## 8.6. Estimating bird numbers for long-term monitoring

- Baseline species list – work as team to keep checklist of all species observed on the island – midday meeting to collate notes from previous 24 hours
- Species recorded in 2006 along with their approximate numbers.

## 8.7. Island Fly-ons for long-term monitoring

- You will need binoculars and notebook and pencil
- View from the boat (RV Bounty Bay) anchored opposite landing site on lee of island
- Two observers on BB upper deck, first observer looking out one side and second covering other side, both out to c.150 m from boat (i.e. max distance of safe species ID)
- Count during the last 90 minutes of light 1630-1800 h?
- Count the sensitive birds only (**bold in table below**) flying on to the islands in late afternoon
- Subtract those individuals returning to sea – in the note book, mark each sighting as e.g. 1, 5, 1, -1 etc, and add total at end (see below).

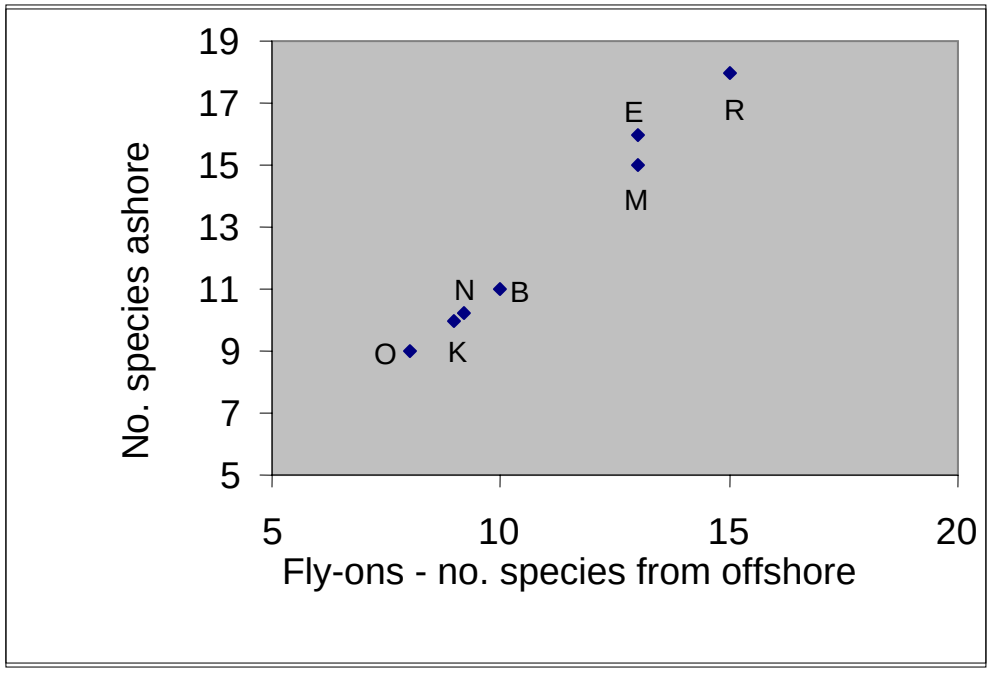
- Record all other species coming in, but no need to count them.
- Transfer totals and other count details to data sheet that evening.
- Aim for at least four evenings per for Rawaki and McKean and at least two nights of data at Birnie in May-June 2008.

Example of Fly-on page from notebook

| Site: Rawaki SE side | Observer R Pierce | Date/time: 29-5-08; 1900-2100 h | |
|---|---|---|---|
| Kiribati name | Species | Running score | Total |
| **Te ruru** | **PhPe** | **1 1 1 -1 2** | **4** |
| **Bulwer's petrel** | **BuPe** | | **0** |
| **Te tangiuoua** | **WTSW** | **5 4 1 5 3** | **18** |
| **Te tinebu** | **CXSW** | **1 3 3** | **7** |
| **Te nna** | **AUSW** | **3 4 5 1 1 1** | **15** |
| **Te bwebwe ni marawa** | **WTSP** | **1 1 1** | **3** |
| **Te raurau** | **BLNO** | **1 1 1 1 1 3 4 5 2** | **19** |
| Te taake | RTTB | | P |
| Te mouakena | MABO | | P |
| Te kibwi | BNBO | | P |
| Te koota | RFBO | | 0 |
| Te eitei are e bubura | GRFR | | 0 |
| Te eitei are e aki rangi ni bubura | LEFR | | P |
| Te tarangongo | GBTE | | P |
| Te keeu | SOTE | | P |
| Te io | BNNO | | P |
| Te mangikiri | BKNO | | 0 |
| Te matawa | WHTE | | P |

Notes: Light SE wind, clear.

Fly-ons on each island correlate with land surveys - see graph below; R = Rawaki etc



## 8.8. Te Raurau for long-term monitoring

- You will need headlamp, notebook and pencil
- Carry out density estimates by distance sampling random transects at night on Rawaki, McKean and Birnie, by:
- Spotlight(headlamp) out to 10 m either side of approximate straight line route
- Count numbers per 100 m = 0.2 ha, replicated c.20 times, check variability
- Count more if needed (may be nil returns on McKean, Birnie).

Summary of bird species at Rawaki, McKean and Birnie in 2006

| Kiribati name | Species | English name | Rawaki | McKean | Birnie |
|---|---|---|---|---|---|
| Te ruru | *Pterodroma alba* | Phoenix petrel | 11+ | | |
| | *Bulweria bulweri* | Bulwer's petrel | 1 | | |
| Te tangiuoua | *Puffinus pacificus* | Wedge-tailed shearwater | 250+ | 2 i | |
| Te tinebu | *Puffinus nativitatis* | Christmas shearwater | 500+ | | |
| Te nna | *Puffinus lherminieri* | Audubon's shearwater | 800+ | 60 | |
| Te bwebwe ni marawa | *Nesofregetta fuliginosa* | White-throated storm-petrel | 20+ | 10+ | |
| Te taake | *Phaethon rubricauda* | Red-tailed tropicbird | 70 | 34 | 4 |
| Te mouakena | *Sula dactylatra* | Masked booby | 700 | 400 | 109 |
| Te kibwi | *Sula leucogaster* | Brown booby | 24 | 75 | 9 |
| Te koota | *Sula sula* | Red-footed booby | 3 | 60 | 3 |
| Te eitei are e bubura | *Fregata minor* | Great frigatebird | 5 | 400 | |
| Te eitei are e aki rangi ni bubura | *Fregata ariel* | Lesser frigatebird | 4300 | 1500 | 20i |
| Te tarangongo | *Sterna lunata* | Grey-backed tern | 1000+ | 800 i | 300 |
| Te keeu | *Sterna fuscata* | Sooty tern | 10000 | 500 i | P |
| Te io | *Anous stolidus* | Brown noddy | 4000 | 1630 | 2000 |
| Te mangikiri | *Anous minutus* | Black noddy | <10 | 6 | 1 i |
| Te raurau | *Procelsterna cerulea* | Blue-grey noddy | 7000 i | 1 i | 2 i |
| Te matawa | *Gygis alba* | White tern | 20+ | 100 | 27 i |
| Te kun | *Pluvialis fulva* | Pacific golden plover | P | P | P |
| Te kirikiri | *Heteroscelus incanus* | Wandering tattler | P | P | P |
| Te kewe | *Numenius tahitiensis* | Bristle-thighed curlew | P | P | P |
| Te kitibwa | *Arenaria interpres* | Ruddy turnstone | P | P | P |

Use and storage of data – discussion and agreement on how (hard vs digital), where (multiple offices) and who has overall responsibility. Further work-shopping as needed.

# 9. INVASIVE SPECIES – DRAFT PREPARED FOR PIPA WEBSITE

## The vulnerability of Phoenix Islands biota

The Phoenix Islands are one of the planet's special wilderness areas, a remote coral atoll system that provides a home for a unique assemblage of plants and animals. The fragile vegetation is dominated by low scrub such as *Tribulus, Portulaca* and *Sesuvium* and stands of taller scrub and trees e.g. *Scaevola* and *Cordia*. The fauna is dominated by a diverse suite of seabird species, which often nest in spectacularly large colonies containing tens of thousands of frigatebirds, terns and noddies. Several species are threatened, like the Phoenix petrel and white-throated storm-petrel (refer Seabirds). Because of these marine and terrestrial values, the islands are listed as a Key Biodiversity Area in Conservation International's Ecosystem Profile and an Important Bird Area by BirdLife International.

*Photo(s) of seabirds*

### Invasive plants and animals

A key reason why the Phoenix Islands support such outstanding flora and fauna values is that the islands have been isolated for millennia. This has enabled the seabirds and other fauna to live and nest safely in the absence of invasive pests and exploit the food rich seas around the islands. Invasives are plants and animals that have been introduced from elsewhere and which proliferate and impact on the indigenous ecosystems and species of their new home. Many invasive plants and animals have been introduced to the Phoenix Islands with varied and often catastrophic results. Impacts can be direct (e.g. predation) or indirect, e.g. subtle changes in habitat and loss of potential source of food (e.g. frigatebirds relying on other birds for food source). Some of the more serious invasive species currently present include:

- Pacific rats which have eliminated the more sensitive small seabirds over time, and reduced the populations of lizards and invertebrates.
- Asian rats which have recently arrived on McKean Island and devastated the local fauna (see "A recent disaster" below).
- Rabbits which are damaging the Rawaki ecosystem and compete for shade with seabirds and destroy their eggs and young.
- Cats which have eliminated many seabird species from the large islands.
- Pigs and dogs which are sometimes introduced to some of the large islands where they destroy seabird colonies.
- Lantana and other weeds, particularly on Abariringa. Even the dense coconut plantations of Manra, Orona and Nikumaroro are a recent introduction as they were planted mainly in the late 1930s during a temporary period of human resettlement and they are currently colonizing Enderbury.

*Photo of Enderbury with seabird colonies and scattered coconut trees*

## A recent disaster – the Asian rat invades McKean Island

During the 1960s McKean was one of the flagship islands of the Phoenix Group, supporting diverse and important populations of seabirds – there were thousands of blue noddies and white-throated storm-petrels, and several other species of tern and shearwater rivalling the numbers that were present on Rawaki (Phoenix Island). However, Asian rats have recently colonized McKean, apparently when a fishing trawler was wrecked on the island about 2002. A CI-sponsored survey by Pacific Expeditions Ltd in 2006 found that storm-petrels, blue noddies and other petrels and shearwaters had virtually disappeared from the island as a result of intensive predation of adult birds and their eggs and chicks by the rats. Should a similar invasion of this large rat occur at Rawaki, it would eliminate the last viable populations of several seabird species in the Phoenix Islands, including the endangered Phoenix petrel, white-throated storm-petrel, Christmas shearwater and blue noddy.

*Photo of wrecked boat*

## The main groups of invasive pests that threaten the Phoenix Islands biota and key needs for biosecurity

Many invasive species of plants and animals threaten the integrity of the Phoenix Islands. Some of these are not yet recorded in the Group, but they could easily reach the islands in the future. Key species and groups of invasives are summarised below.

| Pacific rat – *Rattus exulans* | *Photo of Pacific rat* |
|---|---|
| Location: most islands | |
| Impacts: – eat eggs and chicks of small seabirds, eat lizards and modify ecosystem | |
| Biosecurity needs: eradicate Pacific rats from key islands including initially the small Birnie Island to allow recolonisation by many seabird species from neighbouring Rawaki; improve biosecurity, e.g. ensure rats are not shifted from island to island. | |

| Asian rat - *Rattus tanezumi* | *Photo of Asian rat* |
|---|---|
| Location: Recently arrived on McKean Island; this and related species are likely to be present on many fishing vessels in region | |
| Impacts: – kill most seabirds and their eggs and chicks, kill lizards and modify ecosystem | |

| | |
|---|---|
| Biosecurity needs: urgently eradicate McKean rats; improve biosecurity, e.g. impose need for the removal rats from all authorized vessels in PIPA and bait stations to be maintained on them; no illegal landings. | |

| | |
|---|---|
| European rabbit – *Oryctolagus cuniculus* | *Photo of rabbit or rabbit damage* |
| Location: Rawaki – released 19th Century | |
| Impacts: – loss of plant species and increased erosion, loss of eggs and chicks of seabirds, especially burrowing petrels, storm-petrels and shearwaters, including serious threat to the continued survival of Phoenix petrel | |
| Biosecurity needs: eradicate rabbits from Rawaki. There is no chance of recolonisation. | |

| | |
|---|---|
| Feral house cat – *Felis catus* | *Photo of cat* |
| Location: Orona, Manra, Abariringa; recently died out at Enderbury and possibly Nikumaroro | |
| Impacts: – complete loss of all petrels, storm-petrels, shearwaters, blue noddies from islands on which cats occur and declines in most other seabird species including tropicbirds, boobies and frigatebirds, and possible decline in lizard populations | |
| Biosecurity needs: eradicate cats from Orona and other islands. Ensure cats are not brought to islands. | |

| | |
|---|---|
| Invasive ants | *Photo of crazy ant* |
| Location: not known from the Phoenix Islands, but yellow crazy ants, red fire ants and others are present at an increasing number of ports in the Pacific Region and easily transported by boat | |
| Impacts: – potentially devastating impacts to fauna and flora and ecology of the Phoenix Islands. Invasive ants can kill not only other ants, but also larger invertebrates, lizards and seabirds, including the threatened species present | |
| Biosecurity needs: increase biosecurity levels e.g., ant surveillance (and control if needed using Ripcord insecticide) at embarkation ports for regular sailings to the islands, surveillance on boats, and surveillance at likely invasion points (Abariringa, landing points and camps on the other islands) and act on any detection of invasive ants. | |

| | |
|---|---|
| Invasive plants | *Photo of lantana* |
| Location: not known from the Phoenix Islands, but yellow crazy ants, red fire ants and others are present at an increasing number of ports in the Pacific Region and easily transported by boat | |
| Impacts: – potentially devastating impacts to fauna and flora and entire ecology of the Phoenix Islands. Invasive ants can kill not only other ants, but also larger invertebrates, lizards and seabirds, including the threatened species present. | |
| Biosecurity needs: increase biosecurity levels e.g., ant surveillance (and control if needed) at embarkation ports for regular sailings to the islands, surveillance on boats, and surveillance at likely invasion points (Abariringa, landing points and camps on the other islands) and act on any detection of invasive ants. | |

## Harvesting of birds and crabs

Harvesting of birds and crabs occurs intermittently in the Phoenix Islands, but this does have the potential to impact on species populations. For example eggs of nesting seabirds are sometimes collected at Abariringa, which may result in the colonies being depleted or even abandoned. Meanwhile, some visitors to Nikumaroro have harvested coconut crabs which could result in a significant reduction in the local population. This is the only island in the Group with a healthy population of coconut crabs and this resource needs to be carefully protected.

*Photo of coconut crab*

## Pest eradications

As a first step towards biodiversity recovery on the islands of the PIPA, it is planned to eradicate mammalian pests on the three small islands of Rawaki, Birnie and McKean (hopefully in 2008). This will enable populations of the Phoenix petrel and white-throated storm petrel and other important seabird populations to be secured at Rawaki and recolonisation of Birnie and McKean subsequently made possible.

## 10. GLOSSARY

| | |
|---|---|
| Biodiversity | The diversity of plant and animal life in an area, including the habitats and species present, and their genetic composition. |
| Biosecurity | Protecting an area (e.g. CXI and PIPA) from foreign and potentially invasive species. |
| Biota | The plants and animals that occur in an area, e.g. CXI biota. |
| Compliance | Making sure the laws are followed, e.g. protection of birds. |
| Containment | Confining an invasive species to a small area, i.e. preventing its further spread. |
| Ecological restoration | The restoring of habitats, species and natural processes, e.g. flowering and seed dispersal by removing pest mammals. |
| Ecosystem | All living and non-living parts of an area (e.g. on an island or in a lagoon) and the relationships between them. |
| Eradication | Total removal of a pest species as opposed to management or control. |
| Food web | Relationship between plants and animals that consume different foods, including one another, e.g. the complex food web of the PIPA involves crustaceans, browsing fish and predatory fish, birds and mammals. |
| Habitat | The place where you typically find a species, e.g. trees are the nesting habitat of the red-footed boobty and the ocean for feeding. |
| Indigenous | Native to an area (e.g. all seabirds in the PIPA and CXI). |
| Invasive | Plant or animal that invades an island (usually with the help of people) and becomes a pest |
| Invertebrate | Animal with external skeleton, e.g. insects, molluscs, crabs. |
| Lure | Attractant, e.g. taped calls for attracting seabirds; food for ants. |
| Migrant | Animal with regular (usually annual) movement between breeding area and non-breeding area, e.g. waders. |

| | |
|---|---|
| Monitor | Repeated observations to determine trends in numbers or diversity of species, e.g. annual survey seabirds at an island. |
| Pest | Plant or animal that is alien to an area and can impact on indigenous species and habitats, e.g. rabbits on Rawaki. |
| Predator | Carnivorous animal, e.g. cat, most seabirds; whereas rats are usually omnivores (varied diet of plants and animals). |
| "Ripple effect" | When something unexpected happens during restoration, e.g. one indigenous species outcompetes another for a period of time. |
| Rodent | Mouse or rat. |
| Surveillance | Continuous observations, usually for invasive pests, e.g. London port surveillance for ants, rats, etc. |
| Sustainable | Something that can be maintained into the future, as opposed to say poaching of adult seabirds, which is unsustainable. |
| Survey | A "one-off" set of observations, often to assess threats and opportunities for recovery, e.g. the PIPA Conservation Survey in 2006. If specific observations are repeated, this is monitoring. |
| Terrestrial | On land, e.g. terrestrial ecosystems are forests, shrubland, etc. |
| Threatened | A plant or animal considered to be at risk of extinction. |

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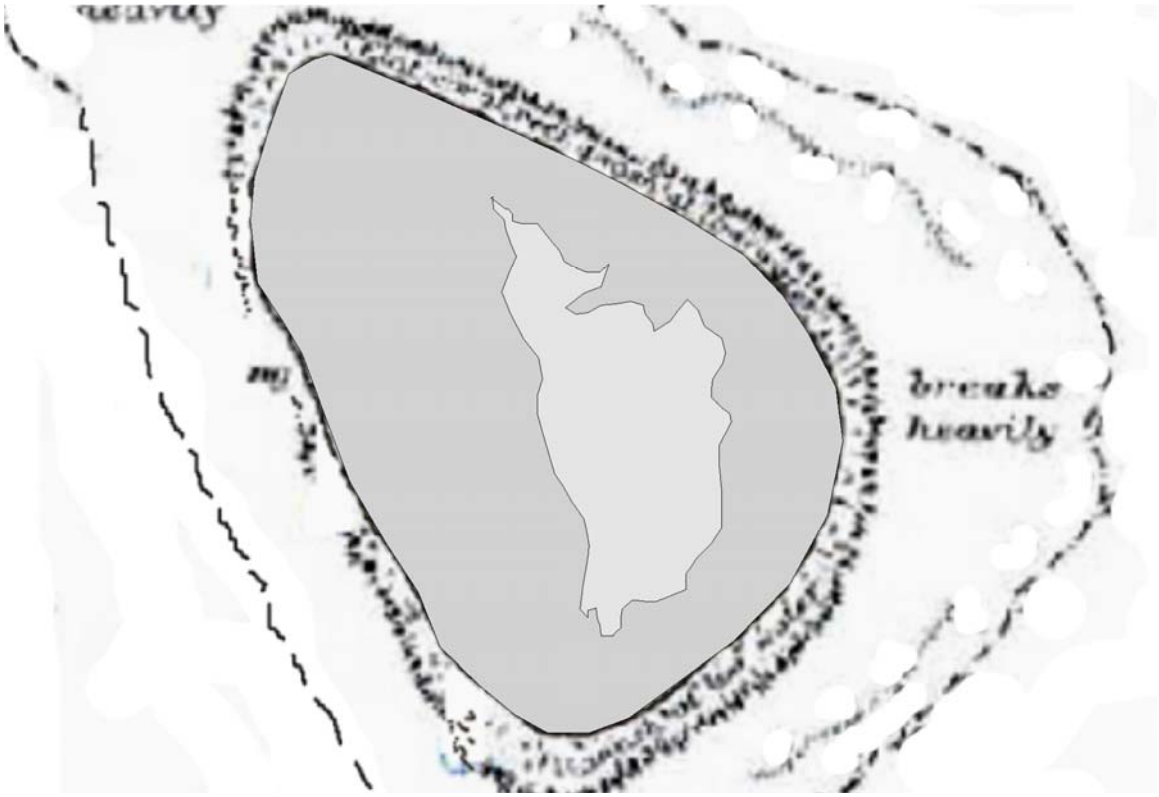
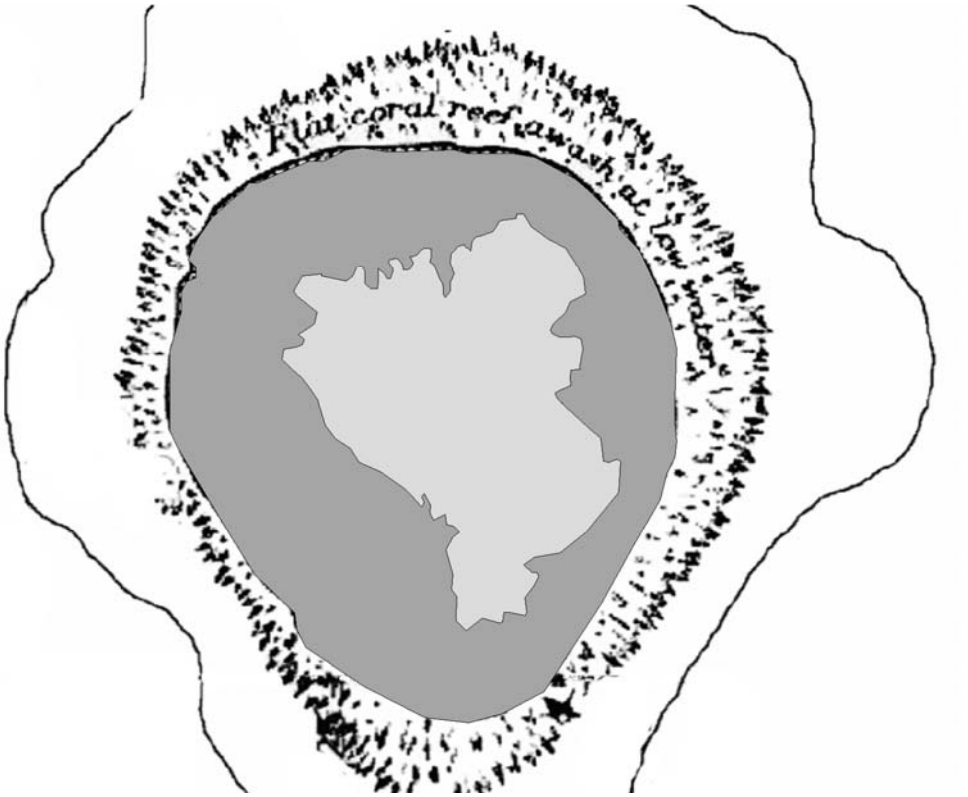
## 12. PIPA ISLAND MAPS

### Rawaki



Birnie



McKean